

Evaporative Introduction of Air Molecules to Bodies of Water Enhances Subsequent Evaporation by Reducing Surface Tension – Addendum to 9 January 2025

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Introduction

With regard to both the Mpemba Effect and with regard to efforts toward enhancing the efficiency of steam generators, it is important to understand why it is that heated water freezes more quickly under a given set of conditions than does water already near the freezing point. The publication of 9 January 2025 specified three distinct tributary factors to the Mpemba Effect. This publication will address itself to a potential fourth tributary factor in the Mpemba Effect which may have practical application in the area of enhancing the efficiency of water distillation and steam-based electrical generators.

Abstract

Of note in studies into the Mpemba Effect is the fact that pre-boiled water, if allowed to be reduced to room temperature and to rest at that temperature for upwards of a full day, freezes more quickly when compared to water which was not boiled.

I propose that boiling water or even heating it beyond the evaporation point introduces some quantity of atmospheric gasses to the water through an aeration effect. When a water molecule is launched into the air through evaporation, I propose that this creates a wake in which an air molecule may be exchanged and forcefully plunged into the body of water. Just as salts added to water will reduce the surface tension of a body of water, I propose that the presence of air molecules in a body of water reduces the surface tension of water (in other words, water's cohesiveness with itself) and that this reduced surface tension causes the evaporation point of water to be decreased. It is already known that adding salt to a pot of boiling water will make it boil more vigorously and at a lower temperature, which is an old trick used by cooks to prevent pasta from sticking to itself in the pot.

If the water is aerated, the effect is similar to but more subtle than the effect produced by adding salt to the water in terms of changing the boiling and evaporation point.

Conclusion

This factor may be the primary instigating factor in the Mpemba Effect. Strong evaporation at the surface of a body of water and its production of acoustic energy results in the release of any latent heat in the system, allowing for the latent heat to be released earlier in the chilling process; attributed as the primary factor in the 9 January 2025 publication; is a likely secondary factor.